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Business Data Processing Challenges for the Sixties

Ned Chapin

Introduction

▶ The decade begun this year affords an opportunity to review progress to date and to consider the outlook for the future in business data processing. It is by a review of this nature that some of the challenges of the coming decade can be more clearly seen. These challenges, after all, are built primarily upon the defects of the past and the conditions and trends of the present. Let us begin, therefore, by reviewing briefly the developments of the past decade.

One of the most outstanding features of the past decade was the rapid improvement in data processing equipment capability. A review of the technical literature of the field shows how extensive and significant this rapid improvement has been. Advances in speed, storage capacity, and other design specifications have been outstanding and have followed closely upon each other's heels. Less progress can be seen, however, in using the capability the designers so thoughtfully provided. In fact, it seems that very little fundamental advance has been made in the manner and degree of using this capability. In other words, the advance in sophistication of use fell short of the advance in the equipment capability provided. This might be because data processing does not require the equipment capability offered[1]; or it might be because of defects in use of equipment capability.

A related factor is that users commonly have not realized their expectations, even when they were formed through careful study and serious investigation. This may reflect some imbalance between the capability of the equipment and the nature of the data processing applications, or it may reflect the way the equipment has been put to work. In any event, it appears that a major gap developed during the past decade, and that the gap today remains unfilled. For these reasons, it is appropriate to consider the outlook for the future.

To clarify the discussion, let us organize it into three areas: (1) The *goals* that might reasonably be worked toward in the field of data processing; (2) the *problems* impeding work toward these goals; and (3) some *methods* of attack that might be used to help overcome the problems.

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1. Except in some instances, the writer considers this view to be generally devoid of logical foundation; hence he ignores it hereafter.

Goals

Goals discussed here are related to the general goals of business enterprises. It is only to the extent that data processing can contribute to the overall efficient functioning of a business that it has any place in business.

One of the fundamental goals of business is to improve utilization of resources; to try to produce as much profit from them as possible. Profit is the difference between revenue and costs. It is observable that data processing generally contributes directly to costs but only indirectly to revenues. It contributes directly to costs in that it costs money to process data, but the result of data processing does not necessarily produce a salable product. Instead, the result provides management with information, to help make decisions which it is hoped will improve ability to earn revenue, etc.

For these reasons, the profitability of data processing in business is normally evidenced by a comparison of costs of alternative data processing systems[2] which produce the same output. The traditional feasibility study generally attempts such a comparison. This comparison of costs for output suggests a further two-fold breakdown:

1. How to obtain more of the desired output from a given data processing system.
2. How to obtain a given output with a less expensive system.

The goals for the future decade lie in these two areas. It is not suggested that there are no other goals of value; it is just that these two areas seem to be of major significance.

1. Service Goals

A future goal area is to design data processing equipment that will be able to do, in major part, jobs presently performed by human beings. Under the assumption that some jobs may be done faster, better, or less expensively by equipment, two specific sub-goals may be listed:

a. Design and develop equipment to perform the changing and adjustment of industrial operations. This is sometimes referred to as computer-controlled actuator equipment.[3]

b. Design and develop equipment to acquire data from events or conditions with minimum human intervention. This is sometimes referred to as digital sensing and recording equipment.

To develop ways of using available equipment to do human jobs, two more specific sub-goals can be listed:

c. Develop ways of using equipment to do still more of the programming work. Automatic coding techniques such as COBOL represent an important step along this road, but much improvement is still possible.

d. Develop ways of using equipment to do the systems analysis and design work that must precede programming. This is an area that is almost untouched as yet, but which offers important potential. The present marshalling of data processing resources to accomplish a job is barely an art, let alone a science.

Another service goal might be to integrate existing applications. A number of data processing applications today are spotty and piecemeal. They do a little bit at a time. Integrating these applications into a few larger applications could eliminate some of the overhead that accompanies doing parts of things in small batches.

Data processing might also be extended to include industrial control, especially control over major business operations. In the process industries, a start was made in the past decade on control applications. The transference to non-process industries of these applications, together with their considerable expansion, appears to be an attractive goal.

2. Cost Goals

Let us now consider some of the goals designed to lower costs for data processing. One goal is to improve the price/capability ratio of the equipment. This is primarily a design and manufacturing problem and is only partly dependent upon applications *per*

2. A "system" is a combination—for a purpose—of equipment, personnel, and procedures.

3. The writer is aware of most of the equipment at present on the market which is offered for these purposes.

se. Another goal relates to personnel costs. This is vital; personnel costs with equipment costs account for the bulk of the cost of using data processing equipment. Personnel cost can be reduced in three major ways:

a. Produce higher levels of skill among personnel (although this is not a challenge unique to data processing work). It is present in other types of work and is the challenge facing every decade.

b. Transfer personnel skills to equipment. This idea is closely related to a goal just discussed of designing data processing equipment to do human jobs.

c. Develop better conceptual tools for personnel. This development is partly a matter of getting equipment to do part of the work (a point which has been discussed previously) and of devising new methods and approaches for tackling problems.

Other cost reduction goals are concerned with, for example, maintenance. The reduction of such costs, however, is primarily a matter of design of equipment and the selection of components. It is an area not unique to data processing.

Problems

In general, the problems met when working toward goals depend in part upon the goals and upon the methods of attack used. Two of the most significant goals identified above were to develop ways of using data processing equipment to help systems design and analysis and to aid further in programing. These goals are related to subgoals such as reducing personnel costs, transferring skills to equipment, and developing better methods.

Even a casual consideration of these goals indicates that each depends on some of the other goals and upon work outside the field of data processing. A good job of programing depends upon the results of a good job of systems analysis and systems design. Systems analysis and design depend upon an understanding of business operations and of the role of data processing and communication in business.

In equipment design, two goals were listed: The design and development (1) of actuator and (2) of data acquisition equipment. These are related to goals just mentioned because the design specifications of needed equipment depend in part upon the design of the data processing systems in which they will be used. Until improved methods of systems analysis, design, and programing are available, not much significant progress can be expected toward the goals just discussed. This should not be interpreted to mean, however, that some design and development work on a concurrent basis is unwarranted. Computers were developed without adequate systems concepts for users, but proved useful. In the same way, actuator and data acquisition equipment can be put to work. But would not the initial design specifications of the equipment developed be superior if founded upon good data processing systems analysis and design?

The goal of extending applications to include non-process control depends in large part upon the availability of actuator and data acquisition equipment. This equipment is as the hands and the eyes for such applications. But systems analysis, design, and programing are also basic, because of the large scale of such control applications and their incorporation of financial data.

The goal of integrating existing applications encounters the problem of cost. Cost might be reduced in several ways:

1. An integration of existing applications may result in more efficient data processing. Such integration appears to rest upon systems analysis and design advances discussed previously.

2. Improved programing techniques may reduce programing costs, especially in handling the inevitable changes in programs. This depends in part upon the development of more powerful automatic coding techniques mentioned before.

3. The use of data acquisition and actuator equipment to bypass many present manual operations. This requires the development of improved forms of such equipment.

It appears, therefore, that the goal of integrating existing applications depends, in large part, upon progress made in meeting some of the other goals.

In summary, a review of specific goals points up the important problem of the partial interdependence of the goals. This, in turn, suggests two other groups of problems: (1) Concurrent, organized, or sequential work toward the goals; (2) The maintenance of communications and interchange of ideas among groups working in different areas toward these goals.

Deciding what work must be done to progress toward these goals depends in part upon the orientation given groups working in the field and upon the work already accomplished. Related are problems about how to do the work: Where do the ideas come from? What methods can be used? Who shall do the work? One of the characteristics of the data processing field is a scarcity of informed personnel. It is likely that informed personnel will continue to be short during the new decade.

Other problems are: Who is to pay for having the work done? Somebody must; it costs money to put personnel onto a problem and keep them on it until results are achieved. What should be the scale of effort? The larger and longer the effort, the more money needed. (And there are always problems of supervision and direction.) Where is the work to be done? Who will do it? Work done at some centers may be biased.

The problem of reporting and disseminating results of studies is also significant. Closely related is the problem of how to get reports from persons with different backgrounds, so that the significance of what is being accomplished can be appreciated. This is partly a problem of relations between groups working on different segments of the total.

Methods of Attack

A number of possible methods of attack on these problems have merit. The best ones, of course, would be those that would not require money, manpower, or time; that would produce results immediately; and that would be readily applicable. Although the writer has looked diligently for such methods of attack, he has found none. All methods of attack worthy of serious consideration involve substantial amounts of money, manpower, and time. The methods suggested here are, therefore, far from ideal, but a review of the basis for them may be helpful.

It is common knowledge that automatic data processing computers increase the overhead while they at the same time (hopefully) reduce some variable costs. To break even, the increase in the fixed costs must match the decrease in variable costs. Too often, however, variable costs are not reduced enough to offset the increase in fixed costs. It has also been observed that the overhead expenses of computer manufacturers themselves are very large. Most of this expense is in sales, sales promotion, research, and development.

A recent study conducted at Princeton University indicated that businesses (apparently regardless of type) which develop new approaches, new methods, new ideas, and new products generally have relatively high fixed costs. Conversely, businesses which are primarily users or adaptors of new approaches, methods, ideas, and products developed by others generally have relatively low fixed costs. This at least was concluded from the sample studied, even when a business purchased its research or new-approach service, from consultants.

In studying data processing, one is struck by the fact that millions of dollars of fixed costs have been and are being spent to advance the "art," yet the actual progress made is small. A good part of the money, of course, has been spent in training personnel, developing programing materials, and in preparing technical sales aids. Such expenditures have been made by computer manufacturers, computer users, and independent groups.

There seem to be large areas of *duplication*. For example, nearly every manufacturer has produced automatic coding techniques and application summaries. Nearly every computer user has prepared and individually programed each application, as if it were

totally different and new, even though certain processing situations are similar from company to company. Some users have even prepared their own automatic coding techniques. In other words, although millions of dollars have been spent, much has been duplicated effort. The problems have not been tackled in such a way that real progress can be identified. Rather, the same ground has been covered again and again in practically the same way.

It appears, therefore, that a major challenge in solving the problems identified in this article is to *eliminate wasted effort.* Another challenge is to develop tools—tools comparable to those available to workers in other fields.

Experience needs to be accumulated, analyzed, and disseminated. An overall study of existing applications would be very helpful: to define the character of existing applications, the conditions under which they operate, the problems observed in their development and operation, and the solutions attempted. Comprehensive surveys of existing applications could help to make the experience of different organizations generally available. They would result in a gradual codification of accumulated experience.

Trends in computer applications need to be studied. Information about the character, conditions, problems, and solutions of all types of applications — successful and discarded — needs to be accumulated. Such information could help to develop improved design specifications for data processing equipment. The teaching of data processing can also be improved. The questions of adequate course content and teaching methods need attention.

Outlook

Some of the problems of developing the methods of attack suggested above are basically financial. Because of the heavy demands upon funds and personnel noted previously, no quick action seems likely. But there is hope. The recent COBOL effort has demonstrated two things: (1) Some users and manufacturers of data processing equipment are starting to recognize the existence of common data processing problems, and (2) they are realizing that an "each alone" approach is not the best or only one.

The sponsorship of several of the professional associations would help to get some action organized. **s/p/a**

The Total Systems Concept

Edward L. Lach

▶ Everywhere today in the literature which discusses systems work, the goal of a *total* system is inferred, yet few companies, if any, have reached the point where each facet of the business is tied into a total system. The conclusion then must be either that such a goal is not possible or that it is one which systems men must continue to pursue.

If we compare the great strides which have been made in automating manufacturing plants to the progress made in achieving

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a total data processing or communications system, we can further conclude that progress has been made primarily in the plant. In many cases, management is hours and sometimes days behind what is actually happening in the plant. Supervisors and clerical help—the pencil pushers—spend a large percentage of their time compiling reports which seem unrelated to the actual process of production. Uncertainties about coordination between data and material cause obstacles: for example, in-process inventory is allowed to accumulate and over-runs become the rule rather than the exception.

Basically these problems arise because of failure to automate production reporting systems—the paperwork involved—so that data processing can keep up with production. Our job today then is to automate paperwork processing in order to provide local and corporate management with fast and accurate operating reports. This is not all, however. We must go even farther. We must automate management communications themselves. We must eliminate red-tape delays and find ways to streamline decision-making responsibilities. This will no doubt require much study, a realignment of existing organization structure, and some drastic changes in past paperwork processing practices.

In order to accomplish the objectives of a total systems concept, we must tie together the various operations of a company with control reporting methods so that the right hand knows exactly what the left hand is doing not as of yesterday, last week, or last month, but now—today. Fast accurate flows of input communications tied into electronic computers are a total systems concept. The very latest in display devices must be used. Many of these devices hold a promise for developing the total systems concept and are not yet fully appreciated by management or systems men.

Display devices will be employed in what we might call management decision-making rooms. The present organization practice of putting our sales managers, controllers, treasurers, purchasing agents, production planning managers, and quality control managers into separate offices and separate departments will be changed drastically. The total systems concept requires that these employees function as a team, working together, analyzing the company's productive efforts, the effect on inventory, the company's sales efforts, and the associated effect on inventory and capital investment. When we achieve real team performance with the members playing from the same set of rules and the score board showing the total result as affected by the actions of individual members, we will have the total systems concept. This today is the big challenge to systems men everywhere.

Although mass production goes hand in hand with volume sales, sales and distribution methods and organization in this area must change also. How much longer can we continue the personal selling relationship with sales representatives fighting city traffic and waiting their turn to get an interview wih a purchasing agent? The trend should be for a company to establish more product display rooms with fewer traveling salesmen and more roving buyers induced by discount prices to visit display rooms. Some evidence of this trend is apparent today in the textile and furniture industry, and in marine equipment and supplies, to mention but a few examples.

"Project Hypo" and "Operation Unimarket" are terms given some interesting experiments which, to a limited extent, involve this kind of forward thinking.

As systems men we have to pay more attention to private thinking and less to public speaking. Too often we find out what Company X is doing and try to apply it to our own company's systems. We must learn to think about our own problems, to exercise creative thinking and imagination in designing systems which fit our particular needs and meet those forced upon us by changing times and new customer motivations. A total systems concept involves top management and so systems men must learn what their communication problems and needs are as well as enlist their understanding support of experiments and changes aimed at achieving the total communication, production, and distribution system concept. **s/p/a**

Forms and Reports Control in Relation to the Systems Function

William Benedon

▶ Conversion to an automated system will fail if it is clogged with unnecessary paperwork. The purpose of this discussion is to present some ideas about forms control — as it relates to the overall problem of systems paperwork controls; objectives of a forms control program, organization status, internal controls, and relationship to other paperwork operations.

* * *

Forms control is the systematic management of business form creation, production, and use for maximum economy and efficiency throughout a company's operations. A main goal of this *economy and efficiency* is to provide management with timely and accurate information for decisions and action. This goal should be extended to all phases of a company's paperwork activities. It can be extended through *centralization*—both physical and functional.

Centralization and Specialization

To be most effective, a centralized forms control program extends into a study of correspondence, reports, filing systems, etc., as well as retention and protection procedures. It should extend into studies of organization, systems, and data processing. While each of the above may have specialized connotations within a company, each is but a facet of the overall paperwork simplification problem. The merit of specialization must not be overlooked but there must be more coordination among specializations. The problem is a colossal one.

There may be merit in the statement, "Take the paperwork out of systems and give it to records management." To illustrate, a systems analyst investigates and develops a system with its related procedures and suggested forms. The forms control specialists then design the forms best suited to meet the system requirement, assure economy in reproduction or procurement, and set up controls necessary to avoid misuse or duplication.

Forms act as veins in a business data processing system. It is the unusual business transaction which does not require a form. Forms should be designed to facilitate data flow. They carry the data through departments of a company, a flow which requires clerical and supervisory time for processing, handling, and filing. Forms control, then, promotes accuracy, improved clerical efficiency, smooth work flows, and cost reductions. The following enumeration pinpoints objectives of forms control:

1. PROMOTE ACCURACY—through proper forms design.

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2. IMPROVE CLERICAL EFFICIENCY — through proper spacing and sequencing of information.
3. IMPROVE WORK FLOW — through proper copy designation.
4. MINIMIZE COST — by consolidation, elimination, and careful selection of duplicating processes.

Forms control, then, should be responsible for:

1. Designing new forms and analyzing those in need of revision.
2. Reviewing existing forms for possible combinations and/or improvement.
3. Controlling form numbers.
4. Writing specifications.
5. Maintaining a history for each form.
6. Serving as an information center on matters relating to forms.
7. Assisting people on paperwork problems which involve forms.

The only logical way to convince a management that it needs to centralize forms control is by pointing out the work simplification and cost saving potentials involved. Using the annual cost of forms procurement as a base, it is relatively simple to show how properly developed forms control can result in at least a 10-15 per cent reduction in printing costs as well as a reduction in the number of forms required for current operations. These are direct, concrete benefits. Other benefits, as indicated, are increased clerical efficiency and more effective control. The initial cost of forms is only a beginning saving. Costs which can be estimated are: printing 4.4 per cent, clerical processing 84.4 per cent, file maintenance, 11.2 per cent.

The development of a forms control program must begin with a collection of forms —*everything* that can be called a form:

Forms mean every piece of paper containing information, printed or reproduced by whatever means, with blank spaces left for the entry of additional information to be used in the operations of the division. They include all permanent as well as temporary forms; those purchased from commercial suppliers as well as those reproduced internally on office duplicating equipment; those used in the smallest as well as the largest quantities; letterheads, envelopes, tags, and all specialty forms.

Authorization

Before a forms control program is undertaken, support necessary to its maintenance must be provided through a policy statement or management directive. Also, its control and development must be positioned within the organization so that it will command necessary recognition. This control has been positioned with apparently equal success in purchasing departments, office services departments, systems and procedures departments, or in special administrative staff groups. *Where* it is placed is secondary to *how* it is developed and supported.

Internal Controls

Before proceeding further, let us make certain that internal controls for maintaining a healthy program are in order.

A good advocate of the need for specialized forms design is the Request for Form itself. Used when a form is requisitioned, it sets the mood. It can illustrate the necessary ingredients — demonstrate work simplification principles through good placement of data, propor spacing, and guide lines. Important operational controls include a specification sheet for forms control personnel, a numbering register, and an index arranged alphabetically by form title.

Numeric and Functional Files. A numeric file and functional file of the forms themselves are important control elements. Since these are likely to be heavy activity files, sturdy manila folders are recommended. The folders become repositories for form histories. They will usually include:

1. Completed copies (4 or 5) of the current form.
2. Request and specification sheet.
3. Design worksheets.

4. Single copies of earlier issues.
5. A record of orders placed, internally or with vendors.
6. Correspondence covering revisions, procurement, etc.
7. Retention schedule.
8. Reference to function file number, if such a file exists.
9. Annual usage record, with departments identified.

The last two items are usually most effective if written on the face of the folder.

A functional file needs only one sample of each form, grouped by function. The main purpose of a functional file is to:

1. Bring together forms serving a similar purpose so that they may be studied accordingly for consolidation.
2. Prevent the creation of a new form if a similar one already exists.
3. Provide a means of locating a form when it does not have a form number or title.
4. Provide a means of identifying company-wide forms for procurement, simplification, coordination, and standardization.

In building a functional file, it is important to note that the word "functional" applies to *use* rather than to a *major operation* or department within a company. Emphasis should be on a use subject. The key to a functional system is to determine simple and rational classifications, provide clear and meaningful definitions of each, and then follow them. The benefits of a functional file overshadow the effort required in its development. To preserve the working value of a functional file and help to get it back to the file when it is removed, each form used in it should be stamped "functional file copy."

There are few instances where the functional file itself is adapted to mechanization. It requires physical availability and manual handling although it lends itself to mechanization since the classification subjects used are usually assigned numerical values. Mechanized functional files will not analyze forms.

Forms control must also keep track of one-time or experimental forms. The forms control function must receive copies of everything run off, with information about the quantity run off, etc. Purchasing department operations should also be reviewed from time to time to control the purchase of forms from the outside.

Reports Control

A forms control program may also include reports:

> *Reports* may be defined as a formal presentation of summary information from one level of management to another or from one organization to another at recurring intervals. Such presentations contain statistical and/or other operating information, reflecting utilization of resources and status of operations, or providing other administrative information useful in judging progress, forming decisions, and directing operations.

Important features in this definition are:

(1) one level of management to another and (2) recurring intervals. Intradepartmental reports and non-recurring reports such as those prepared by engineering or by special study groups follow the same control pattern. A proper analysis of reports can result in several benefits:

1. Reduce amount of information requested.
2. Reduce number of copies and recipients.
3. Re-design contents for greater efficiency in use.
4. Eliminate the report entirely.

The techniques for controlling forms, previously discussed, are equally useful in controlling reports. In any paperwork control program, the *Request for Form* and the *Request for Report Approval* should be cross referenced for related data. So-called bootleg forms often turn up as parts of reports,

particularly when forms control and reports control are handled by separate departments. Number identification is also helpful in controlling reports. A report number should identify subject and origin. The subject reference can be taken from the form functional file. A tie-in with duplicating is also desirable.

Other Paperwork

Other areas of paperwork are retention, records protection, and correspondence and files management. Every company should have a retention schedule; an alphabetical list which identifies each record and specifies its retention period.

Records protection provides security for documents essential to: (a) the resumption and/or continuation of operations, (b) the re-creation of the legal and financial status of the company, (c) the fulfillment of obligation to stockholders, employees, and/or outside interests in the event of disaster. Vital records comprise only 5-7 per cent of all records. Does your company know what operating *forms,* reports, etc., it would need in case of disaster?

Correspondence and files management assures the proper maintenance of documents during their life-span. Within a company concerned primarily with correspondence, such a program may also involve the handling of bulk materials such as catalogs, blueprints, etc., and their filing systems.

How do these paperwork control programs relate to the systems function? As has already been suggested, they are facets of an overall company effort to coordinate, simplify, and mechanize data processing activities. They should work together, teammates toward common goals.

Increased competition and the problems of maintaining a business so that it can meet competition demand cooperation among specialists of all kinds within a company. They belong to the same team. **s/p/a**

Who Is *They?*

Daniel R. Mason

▶ In recent years, the spotlight has been focused on the systems man and the systems man has been grossly unprepared. As proof, notice the findings of a survey of "Paperwork Problems"[1] by Charles Bruning Company, Incorporated, of presidents of 500 of the largest companies in the United States. It contained a multiple-choice question which asked, "What type of counsel has been called in to help simplify paperwork?" In reply, 66.6 per cent of the respondents indicated that they had called in management consultants; 59.4 per cent turned on occasion

1. Editorial, *Management and Business Automation,* October, 1959.

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to suppliers of office and systems equipment; 19.6 per cent relied on systems experts from accounting firms; 13.6 per cent asked for help from business associates, friends, or acquaintances; and 10.8 per cent used internal personnel.

Why does this deplorable situation exist? Three reasons stand out:

1. For too many years, the systems man has spent too much time on a bits-and-pieces approach to data processing problems. He was concerned so much with individual applications that he lost sight of a total systems concept.
2. For too many bosses, the problems of "hardware" completely and erroneously overshadowed the problems of systems. In other words, to heck with the system; let's get it "programmed."
3. "They."

So, the systems man found himself in an environment of converting old systems to a new computer, rather than in an environment of creating new systems in light of the availability of new processing tools.

They

Let us look at a question a systems man might very well ask himself as an example of his problem with *they*:

Question: Why is this report prepared this way?

Answer No. 1: This is the way *they* want it.

Answer No. 2: *They've* been getting it this way for years.

Answer No. 3: If *they* wanted it changed, *they* would have told me.

* * *

"Who is *they?*" Nine times out of ten, the answer is the executive suite. One company traced a report to its executive suite—to the office of an executive who had retired a year ago. In the meantime, his secretary was dutifully receiving and promptly filing the report each month.

They may be the legal department. How many times has it been said in your organization, "The legal department says we have to do it this way"? How many of you have gone to the legal department and asked, "What is the penalty, if any, if we don't do it this way?" Should you substitute a $50 fine for a $5,000 a year processing cost? Even government reports can be changed if you are persistent enough to follow through to the government. "They" in all likelihood are an ordinary man in a little office in a big government building somewhere.

Synonyms

An oft-used synonym for "they" is the word "management." For example, in one data processing center hangs a memorandum stating "Management requests that no smoking be allowed in this center." The note is signed by one of the front-office assistants. Another convenient synonym is "home office." When everything else fails, you may be told, "The home office wants it done this way." Incidentally, it is surprising what happens when a field problem is pursued at the home office. Often the home office will say, "We've been trying for years to get the field to change this, but *they* won't. *The field* wants it this way." So we have a two-way street here: Home office; field. Both excellent words to hide behind when one is opposed to change.

In every case the extremely ambiguous pronoun "they," and its many synonyms, will turn out to be a single individual. You can sell ideas for change to individuals, whereas you cannot sell them to pronouns. Often, too, when the systems man isolates the individual behind the *they* and talks with him, this individual is likely to say, "Gosh, I didn't know *they* could help me like this." When will "they" (himself) discover that the mysterious people who works at solving problems are *you*. When he finds this out, it seems that the statistics referred to earlier should start to change.

Tomorrow and next week, be alert for the word "they." Each time it is used, ask, "Who is they?" You'll be surprised with the results. There is a high correlation between people who use "they" and those who cling to past ways. **s/p/a**

Sustaining Productivity through Management Efficiency

PART II

Peter C. Briant

The purpose of this article is to discuss factors underlying economic growth, to point to the responsibility of business management in promoting and sustaining growth, and to give a conceptual framework for comprehending the role of systems managers in furnishing information on which decisions can be based. Reference is made to growth-retarding factors that systems men encounter in their work and that could be the principal factors inhibiting sustained growth in the future. Part I of this article appeared in the September issue, page 16.

▶ At the same time as technological improvement has narrowed the spread between revenues and costs, it has had the further effect of adding to the fixed cost component of total costs. Direct labor costs have been replaced by capital costs, and there has been a greater need for skilled salaried professionals in management to operate the complex technical equipment now being used. Thus, we see scientists, mathematicians, psychologists, systems men, computor programmers, engineers, administrators, and typists substituted for men on the production line. In manufacturing, the number of white-collar workers has increased by 1½ million since 1940 whereas the number of production workers has risen by only 116,000. The number of engineers, scientists, and administrators has jumped by about 500,000 since 1954.

The logic of the machine man has narrowed the margin of error in which business decisions can be made and has, at the same time, made costs subject to management control less flexible than heretofore. In addition breakeven points have been raised so that there is a greater emphasis on volume. Sales must be sustained, otherwise the rate of return will decline and investment plans will be cut or deferred. Thus, there is a need for more extensive and intensive cultivation of the market place.

Concentration of Economic Power

Concurrent with these developments has been the increase in the concentration of economic power and the size of firms. We have to remember that although there are some 800,000 corporations in the United States, all but about a half a billion dollars of the Federal Corporation Income Tax is paid by only 100,000 of them, or 12½ per cent of the total. To reduce the sample still more, there are only 31,000 corporations earning $100,000 or more and they pay all but about $2 billion of the total corporation income tax. While there is still plenty of opportunity for new firms to develop and expand, as they have done in the field of electronics, synthetics, and synthetic detergents, the degree of centralization of economic control is pretty great even though the ownership of capital has become more widespread. The increase in the size of business firms adds to the problems of controlling internal operations and at the same time

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increases the complexity of producing in anticipation of market needs. There is a difference between producing to serve one local area and producing to sell in markets all over the world.

Significance to Systems Managers

What is the significance of these developments to the systems manager? As a general rule, we might say that the cost of mistakes and the possibility of error is a direct function of the degree of centralization. As a corollary, it might also be said that the greater the degree of centralization, the greater is the need by management for information on which to base decisions. One effect of the growing complexity of economic activity is, therefore, to enhance the importance of knowledge of the particular circumstance of time and place. Developing new and more effective ways to acquire, assemble, and process information for management is, in consequence, the challenge to the systems manager of sustaining economic growth.

It is inappropriate to set forth here how revenues are to be sustained or costs reduced. It does seem useful, however, to sketch in broad terms the areas in which systems management can make important contributions. On the revenue side, there are the techniques of market research, including motivation research, to determine, *why, when,* and *where* people buy. The basis of new work in this field seems to rest large on research in the behavioral sciences of psychology, anthropology, and sociology. Research in these disciplines will also bear fruit in its application to advertising and other promotional techniques.

Operations research, on the cost side, is the discipline which is the counter part of market research. It has introduced the mathematical approach to solving business decision problems.

Neither of these techniques, nor the current trend towards management accounting and psychological testing of employees, have come into being simply because we have learned to do these things. In these cases, as so often has happened in the past, necessity has been the mother of invention. Management of the modern corporation in the light of the structural changes mentioned earlier (narrower margins, higher proportion of fixed costs, and the increasing concentration of economic power in the large corporations) would be an impossible task without the new tools utilized by systems managers. "Enlightened" management has already recognized the value of these techniques and is well aware that decisions have to be based on facts, that in the present competitive world there is no room for management by hunch. It is well aware that profit is a differential, a surplus above costs; that profit is not a reward for doing well but for doing better than one's rivals. Hence, the more accurate the information available about the market external to the firm and the operations internal to the firm, the greater the likelihood of making a profit. The firm that fails to use its systems managers wisely, that does not see that problems heretofore unsolvable can now be solved, will find that consumer patronage sooner or later turns away from firms and industries with low productivity to those with higher productivity and lower prices.

Resistance to Change

A sustained improvement in output-per-man-hour is referred to as progress. Most of the projections of the rate of progress in the next decade tend to leave the impression that future progress is something that will come about automatically; that sustaining qualitative and quantitative improvements in capital is not going to be much of a problem. Continued growth, however, will depend in the future rather more than in the past on the effectiveness with which business managements utilize the material and human resources presently at their disposal.

But efficiency alone is not a sufficient condition. Progress is often referred to as a process of "creative destruction," because it has two aspects: the creation of something new and the destruction of something old. Most of us welcome the creative aspect of progress, while we resent the destructive aspect when it affects us personally. There have been numerous illustrations of these resistances in the past. One has only to recall the Robinson-Patman legislation passed in

an atmosphere of resentment against chain-stores, the steelworkers restrictions on management rights and work assignments, restrictive union practices in the railroad industry, and the Kefauver investigation of the drug industry to see that the presumption is usually in favor of the present product or the present way of doing things.

Such an attitude presents a challenge to systems managers who, in seeking to improve the flow of information to, from, and within an enterprise, often have to obsolete existing equipment, techniques, and jobs. Furthermore, they have the additional problem of convincing top management that their new techniques are superior to the old. By way of illustration, consider how railroad companies compute their rental charges for the use of each others cars. One company incurred enormous clerical costs in keeping track of each and every one of its own and other companies' cars in use on its lines. The record-keeping involved was not considered a cost problem until operations research workers were able to demonstrate how, by using sampling methods, a very accurate clearing could be effected by only one-fifth of the original cost. It was only with great difficulty however, that the systems men were able to convince the management that the new method merited adoption.

The workers' resistance to change is easier to understand because it stems from an erroneous conception of security. Security, to the average employee, means his ability to keep his present job. Under a proper interpretation, security implies the ability to find another job. The systems manager has constantly to be cognizant of the workers' understanding of security and must insure that whenever a job is obsoleted, provision is made for retraining and relocation within the enterprise. As more and more clerical workers are displaced from their present jobs, this problem may become acute, for they often have no skills which they can sell in the open market.

These resistances to change, on the part of owners, managers, and employees, emphasize the need for continued economic growth. The destructive impact of progress is mitigated in a growing economy, for as demand increases it is usually possible to introduce the new piece of equipment or new technique alongside the old.

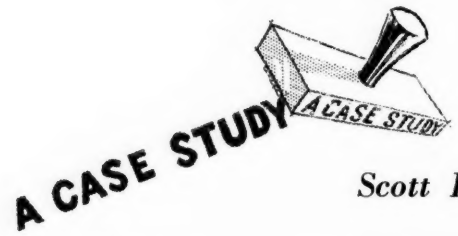
In a system of democratic capitalism such as we have in the United States, systems managers cannot ignore the fact that human beings are naturally conservative. There is always the danger that the rate of progress may be too fast for the masses. Voting in the market place may not be equal as between individuals, but each man has one vote in the political arena. If economic progress leaves too much destruction in its wake, the masses may gradually vote the free enterprise system out of existence. Paradoxically, however, progress is more acceptable to all individuals provided it is sustained.

Summary

The argument in this article may be summarized in the following way:

Continued growth in our output of goods and services is needed in the next decade. This growth depends more on increasing output-per-man-hour than on the effort put forth. Improvements in productivity depend on our supplying the workers with more and better capital equipment to improve their effectiveness. The supply of venture capital for investment in equipment and in research and development is functionally related to the past and prospective rate of return on investment. The rate of return is dependent on managements' ability to maintain the narrowing margin between revenues and costs. The ability of management to do this depends on its having speedy and useful, and hitherto unobtainable, information about markets, competitors, and costs; and having its orders put into action. To a much greater extent than in the past, the desired information will have to be obtained through the use of market research and operations research. In inducing workers and managers to cooperate, systems managers will increasingly encounter resistances to change. To a large extent, whether these resistances are overcome will depend on the skill with which systems managers introduce their new ideas and techniques. **s/p/a**

Duplication of Records in Home and Branch Offices



Scott Kidd

▶ The title, "Duplication of Records in Home and Branch Offices," presupposes the existence of such a duplication. If your company is like mine, you have this problem, but let us not immediately conclude that such duplication is necessarily bad and that all duplication should be avoided. Some duplication is necessary; that is, records necessary for review and control must be retained in a home office even when authority for origination and maintenance of them is delegated to the branches. In many instances, the duplication of records which results, is an improvement over systems which create new or additional records. On the other hand, we should all seek to know about our duplicate records; we should evaluate them and seek to reduce them to a minimum. The following article discusses the writer's experiences in his company in this matter. Most of the observations made in the article are about collection and entry records.

The Company

The Standard Accident Insurance Company is a stock agency company writing casualty, property, and bonding business in all states. In 1959 its total net writings were $71 million. Some of this business was produced by agents who report directly to the home office, but the bulk of it came from twenty branch offices.

The Collection Procedure

A brief review of the history of Standard's processing and collection procedure enables us to see how and why duplication of records exists in this company and how it is seeking to eliminate some of it.

For many years all of Standard's offices were responsible for entry and collection activities. They had underwriting authority, and it was not necessary to send daily reports to the home office on all lines of business. For audit and unit reports and for rating and coding purposes, however, it was necessary to submit daily reports for certain lines. Naturally, copies of these reports were kept in each branch office which originated them. Each branch office was responsible for setting up its own records for these activities and for sending data to the home office to enable it to create necessary punched card records for internal statistics, rating bureaus, state insurance departments, and tax. The record from which the punched cards were made was not a duplicate record but actually an additional one that required special preparation.

Each branch created a set of abstracts for each premium entry. These sets included copies for premium accounting or collection, home office, risk experience, index, renewal notice, expiration, payroll audit, and a register copy. All billing and collection were done from the premium accounting abstract.

Scott Kidd is assistant treasurer, Standard Accident Insurance Company, Detroit, and is in charge of the systems department of the company's home office. He has been with Standard Accident since 1931; appointed to his present title in 1954. In 1958, he began to develop a program whereby the company could review and challenge its systems and procedures to reduce operating expenses. Mr. Kidd received his CPCU in 1948.

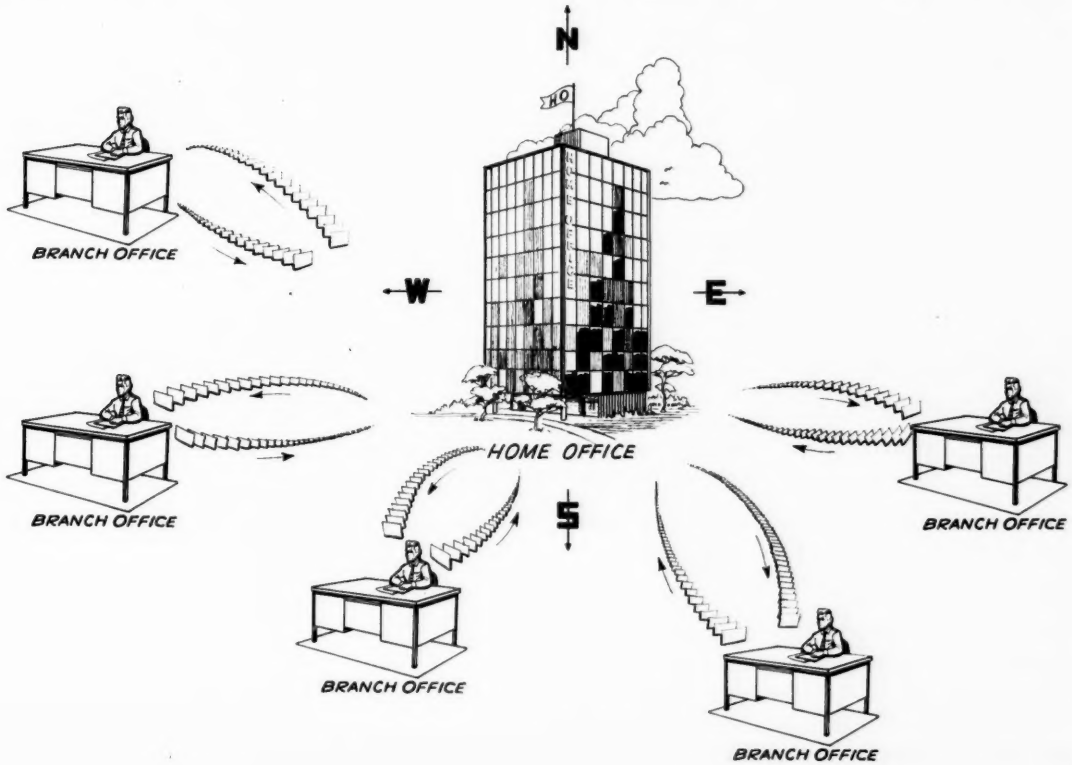
In the late 1940's, Standard started to investigate punched card records in the home office. It found that it could maintain premium accounting records more efficiently on punched cards than as "paper" abstracts. Savings could be realized in the control of premium accounting and in machine billing as compared with manual billing. Success with this new system made the company decide to do premium accounting in the home office to the greatest extent possible.

Since this new procedure made it unnecessary to create an abstract for collections by branch offices, the Company was able to eliminate the typing of abstracts in branch offices and to centralize coding, entry, collection, and key punch activities in the home office, but this could be accomplished only by having a duplicate copy of every branch office "daily" in the home office. So, while the typing of abstracts in branches was eliminated a manual collection operation was transferred from the branches to a centralized machine operation in the home office; it became at the same time necessary to duplicate daily branch office records in the home office.

The Drawbacks

While Standard realized considerable savings from the new procedure, there are some drawbacks. For instance, whenever there is a transaction on a policy, both files (branch and home office) must be brought up to date. For instance, let us take the case of a policy written in a branch office. If at some later date the policy is endorsed in the branch, it is necessary to pull the daily report, prepare the endorsement, and refile it with the daily report. The other copy of the endorsement must be forwarded to the Detroit home office where the file is pulled, the endorsement attached, and the item punched before the daily report is returned to the file — a procedure duplicated in both offices.

In addition to this extra handling, there is the problem of entry control. Although branch offices send information to the home office, they cannot tell when it is entered. Since branch office daily reports are sometimes delayed, the entry of a transaction can be delayed for a considerable period of time.



This situation created a collection problem beyond the control of the branch offices.

In seeking to correct these problems, while still retaining the benefits of centralized machine premium accounting, Standard rediscovered microfilming. Here was a way of transmitting evidence from a branch office without the expense of typing abstracts or maintaining duplicate files in the home office. The Company adopted the microfilming procedure and converted all but its Pacific Department. It has not yet reached a decision as to what will be done in that department.

The Microfilming Procedure

The basic factors involved in Standard's entry and collection procedure as far as the home office is concerned is the transmission of key punch evidence at minimum cost and the elimination of duplicate daily report files. Since the new procedure does not maintain a daily report file in the home office, all statistical coding and information necessary for producing the punched cards must be shown plainly and clearly on the branch office copy. A 16 millimeter microfilm picture is taken of the record in the branch office. When all the necessary records for the day have been microfilmed, the film is cut and sent to a processor who develops it and forwards it to the home office. There the film is projected on a viewer beside the key punch operator who creates statistical and collection cards from it in the same way as she would punch from an actual copy. Thus the advantages of typed abstracts are retained, but the cost of typing them is eliminated. The Company has the advantage of a centralized entry and collection procedure without maintaining daily report files in the home office. After a film has been used for key punching, it is kept for a few months but, it could, in reality, be thrown away immediately after the key punching activity.

Another advantage of this system is that the branch office can now determine when an entry will go through. It assigns an entry date to a roll of film when it is processed and records it on the daily report. The home office punches and enters the transaction in accordance with the entry date as signed by the branch. As a result, the branch has control of entry, a fact which is helpful in the collection activity where the branch must be in a position to answer agents' questions about collections. This procedure reduces correspondence with the home office.

While the use of microfilm for transmitting punched evidence is, in Standard's opinion, an inexpensive process, it does require the coding of daily reports in branch offices. The Company is thinking, therefore, of limiting the process to private car passenger and property risks, except for branches which are large enough to support a coding staff. The coding of property and private car risks should not present a problem. And, the Company can realize substantial savings from the elimination of duplicate daily report files even in these two lines.

Where companies are thinking of discontinuing separate key punch, tabulating installations in small departmental centers, microfilming seems to be an inexpensive way to get material to a home office. With such centralization, expansion can be absorbed with little additional cost. Overall machine rental costs are reduced substantially.

A Casualty Index

Another area of duplication in the Standard Accident Company was in the casualty index. Each branch office maintained a complete casualty index which was duplicated in the home office. Since all underwriting, policy writing, and claim adjustments were handled in the branches, the home office casualty index was little used. This year, Standard discontinued the home office index and initiated a procedure of referring all index requests to the branch concerned. This may seem like a time-consuming procedure but when costs were compared, the cost of referring special requests to branches is negligible. So far, the results are very satisfactory and unanticipated benefits have been uncovered. Frequently, the need to refer to a branch index arose from an error committed somewhere along the line. Now that these items must be referred to the branches, the latter are more aware of errors and their results and can do something about correcting the causes.

A New Policy

Like many insurance companies, Standard

recently issued a special continuous automobile policy at a reduced rate and with automatic direct billing. When it set up a procedure for this new policy, it tried to make the operation as simple as possible. A copy of the application and the policy jacket were kept by the agent. Although the policy was underwritten in a branch office, there appeared to be no further need to maintain a copy of the application in the branch office. Standard developed a system, therefore, wherein the branch reviewed the applications and forwarded them with the check to a special unit (Thrift Auto) in the home office. In this unit, all activities of the new policy are centered: depositing the check, verifying the rating and premium on the policy, setting up an automatic billing file, issuing monthly statements, and checking commissions. Only one file is maintained by this unit, plus the punched cards necessary for renewals. There are no other files in the home office and none in the branches. As claims on these policies come in, they are handled in the branch, therefore it is necessary to check the "home" office files. The procedure is to send the request to the Thrift Auto Unit which will promptly send the necessary information to the office requesting it. This record can be destroyed when it has served its purpose.

The effort here is to avoid duplicate file systems which are not used frequently.

Conclusions

As can be seen from the above, there is considerable duplication of records in a fire and casualty insurance company. While some of these duplicate records are essential, there are many areas where the duplication is not necessary; where it is, instead, primarily a convenience—a very expensive convenience, for files must be maintained and handling costs can be expensive. The Standard Accident Insurance Company feels that it has just scratched the surface in this matter of studying duplicate records. It feels it has taken an important step forward, however, because it *recognizes* that there is duplication and that in some cases at least something can be done about it. **s/p/a**

Education for Systems Work

William C. Gill

▶ Education for *systems* work is but one phase of *education for management*. Many of the problems of educating systems people are found in management education as well. The purpose of this aritcle is to discuss some of these problems. Some of them stem from the fact that both "management" education and "systems" education are relatively new. They result, therefore, from a lack of maturity, a lack of experience, and a lack of tradition and recognized success patterns. One indication of immaturity is found in the teaching of management; it is undeveloped. There is no real body of management historical literature—experience—against which to teach fundamentals. We need a more clearly defined "theoretical base" for management and systems education.

It is a comparatively new idea that the art of management can be taught at all. In reality, not until after the turn of this century did anyone think enough of the idea to start to teach it although management had been identified and developed to some extent before 1900. The present rate of development is, in fact not so accelerated as it was the last 20 or 30 years of the 19th century. How unfortunate that between 1830 and 1900—the management incubation period—not one book was written on management as such.

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The Old

Where did today's established managers learn? Where did the Rockefellers, Jay Goulds, Vanderbilts, and J. P. Morgans, Henry Fords, and Jim Hills learn how to manage their fantastic empires? They did not learn through management education, for there wasn't any. They did not find out by reading management books, for there were none. (It is too bad that they didn't *write* some books upon which we could build an "education" for today's management.) Yet perhaps it is just as well that they did not, for they were a group of rugged individuals in a laissez-faire environment. They probably broke all the rules as we recognize them today. The popular belief still seems to be that you can break every rule of sensible management and succeed. Some of our current publications support this view with almost each issue through case histories of how the bizarre succeed in spite of all.

Let us recognize that, lacking a body of general rules for management, each manager has had to operate to a pattern that resulted from his own personal opinion and experience, a pattern modified only by pressures, if any, from his superior. Trial and error has been the only approach. Some management leaders still claim that there is no place to go for a practical education in management.

The New

We have neither to agree nor disagree with these people to recognize the problem. Management people do not, as a matter of fact, hire people from schools to help them *manage*. They hire them to do something else, and let nature take its course. Those who study management cannot easily get a job managing — they lack experience. So they go to work for people who did *not* study management but who rose to management positions through trial and error and the process of organizational "survival-of-the-fittest." Some of those who survived believe today's student of management has a lot to "unlearn" before he can manage. By the time he is considered ready to manage, he probably *has* unlearned much of what he was taught! He has also probably become inbred to the organization, even assuming some negative characteristics in order to survive. Fortunately there are some counterbalancing aspects, although about 15,000 firms went broke in 1958 according to Dun and Bradstreet—95.4 per cent because of management incompetence and neglect.[1]

The Emerging

But we do not want to paint a distorted picture here. There *is* emerging a body of knowledge in management that management people are putting to work. This body of management lore is not settled or complete, but it seems to be growing. Management people are managing in a more organized, enlightened way than ten years ago.

Have educators been responsible for this positive trend toward developing a body of management knowledge, principles, and techniques? Have they, with their facilities for research, time to study, ability to relate and to draw out precept, developed an enlightened, skilled "management in practice"? As a whole, they have not. In fact, they tend to lag behind management people in developing a new management art. We have met some educators, of course, who seem head and shoulders above management people in their understanding of present-day management problems but by and large educators are not taking the *lead*. Management people who have returned to school to study management complain that the courses are "away behind the times", that considerable updating needs to be done about advanced management as it operates in industry today. For example, they find themselves unable to sit through undergraduate courses using management and industrial psychology texts written a decade ago.

One reason management people are forging ahead of educators is that they are more likely to be able to travel and talk to other management people formally and informally. College people rarely have expense accounts to enable them to do this. The cooperative effort and exchanges of information at various professional management seminars, for example, all too often exclude the academician—yet management needs in developing its body of knowledge and principles the discipline inherent in academic processes.

1. *The Failure Record Through 1958*, Dun and Bradstreet, 1958.

Management needs the educator to help him capture and interpret the learning that results from management experience. In other words, we need the skill of the academician in recording, interpreting, and organizing what is happening to each of us actively involved today in managing.

The Problem

A part of this problem is how to get the information to the academician. The academician is removed from practice, just as the manager is removed from theory. Because of this void, academicians are not as useful to industry as they should be. They are considered "too theoretical" whereas the solely practical approach of the practitioner is usually too shallow, hurried, or superficial, for after all he's concerned with producing a product that will sell at a profit. These supposed differences between theory and practice constitute a real problem in management education.

Yet in management, as in other professional fields, there must be some connection between theory and practice in order to develop a realistic, practical, and useful body of management knowledge. There *must be* some link, therefore, that will draw the two closer together. There must be some common thread which both groups can use in weaving management's mantle, for it appears that neither the practitioners nor the academicians can do it by themselves. How can we find that thread so that both can work together most efficiently toward the common goal. The anticipated result is badly needed.

The Thread

One good place to begin has already been found: formal and informal sessions of local, regional, national, and international management-oriented associations. We should try to arrange matters so that more educators can take an active part in such sessions. They need us to keep up to date; we need them to record, preserve, and communicate to current students a sound philosophy of management. This interdependence and mutual cooperation should help management people accept sound theory as a base for sound practice. It should help managers proceed to the task of managing in a more intelligent, orderly way. Only through such a process can management avoid the expensive and ineffective process of allowing every manager to learn for himself through trial and error.

Small Problems

The problem discussed above is fundamental and critical, but there are other smaller ones which aggravate it. One of these is the persistent idea that students should come out of college trained and ready to go to work. We all know that college is not a training arena for specific types of business. Some management people disregard this and want somehow to slough off their own training responsibilities onto the colleges and universities. This cannot be done; in fact it would be a violation of public trust on the part of educators to provide vocational training for *specific* jobs in commerce, industry, and government. The job of education, among other things, is to provide fundamental values and understandings, not specific techniques. Educators are sensitive to this trust and avoid subjects which have very specific and narrow industrial-vocational emphasis. This sensitivity, in fact, has retarded progress in developing education for systems and procedures analysis.

This brings us to the next aspect of the subject of this paper. Is there any place to go to get an education in systems work today?[2] No place, to this writer's knowledge, is specifically so identified. One reason is the reluctance of educators to institute courses that they believe to be primarily vocational; courses which *train* for specific jobs in industry. Many educators think that systems work consists primarily of such vocational work as designing forms, writing procedures, and drawing flow charts; they believe this is no fare for college courses.

Can we blame educators for holding back on systems education? Not at all; they can only draw conclusions from what they see. What they often see in industry is a so-called systems group designing forms, writing procedures, and drawing flow charts. The fact that there is a greater, a more fundamental purpose behind this activity escapes them;

2. See *Editorial*, January, 1961 issue.

in fact, it escapes some systems people. When systems people stop looking at the mere tools and tricks of their trade as comprising the essence of their profession, they will more quickly get the support of educators.

Like management in general, we in systems work need a sound, realistic although theoretical base upon which to build a college-level preparation and appreciation for the extremely complicated and fundamental management task of systems and procedures analysis, synthesis, and coordination. Until this is done, there will be no place to go to get an education in systems work as such. As it is, there is today no identified body of basic literature upon which education for systems work can be built. To a great extent, each one of us is going it alone trying to draw as best he can from experience, from learning through conditioned reflex, and through survival.

A Principal Medium

One possible ray of light in the dark picture painted above, as has already been observed, is the exchange of experiences through public discussion in seminars, associations meetings, and the like. For most of us, they provide the principal medium by which we learn about systems work. The few college systems courses which do exist today have their roots in such activities. It is good to see that the professional level and point of view of these gatherings is rising and expanding. For example, if you want to lose the better part of your audience and bore most of the others, talk about designing forms, writing procedures, and drawing flow charts. They want to know the bigger purpose; they want to know what is behind all this systems activity and how it can function so as to be of maximum value to the specific enterprises and to our economy and way of life as a whole.

A Start

As we take an overview of this problem of developing management and systems education, what progress can we observe so far. A start has been made. The Systems and Procedures Association, for example, has provided one indispensable ingredient for accelerated progress: money. SPA has provided three Fellowships through a grant to the Wharton School of Finance and Commerce, University of Pennsylvania. Dr. Adrian McDonough heads this effort. A recent visit with him found him enthusiastic and aware of the basic problems in building education in systems. Efforts of practitioners like the writer are different and this is good. In fact, a sound base can be established only when many different approaches have been tried, each making its particular contribution. No one school of business or one school of thought is going to present the complete and final answer to our problems. We have a long way to go before "majors" in systems work are recognized. We submit, however, that even now an education in systems work is available. It is available in the many fine colleges and schools of business. The courses are not tagged, "Part of a Systems Education Curriculum," but the results are there. Part of the problem is that graduates who have this education do not know what kind of job to look for; yet systems people complain that people educated for systems work are not available. They are not, if what is wanted is someone trained primarily to design forms, write procedures, and draw flow charts.

A Curriculum

Let us not overlook then, as we strive for an identified curriculum, those courses which are already available for an excellent education for systems work. Let us not be carried away by the fallacy that systems work is highly technical work. Let us recognize that basically it is work for an administrative (management) generalist who has a few special tools and techniques designed to help him be more precise in his systems work as he tries to improve management's internal administration. Let us explore and develop a little more that which is already available to us.

As it is now, systems people come from all walks of industrial life. They come from industrial engineering, accounting, economics, auditing, journalism, and even philosophy and anthropology. This may be a matter of expediency. Systems men are needed in business, government, and industry. Where they come from tomorrow depends largely upon how successful we are today in identifying management and systems education. **s/p/a**

Writing Readability into Technical Articles

PART III

John Seward Fielden

This is Part III of a three-part article which has discussed how to achieve more readable writing in technical articles. The series was solicited by the editor of *Systems & Procedures* for two reasons: (1) To help readers prepare manuscripts about their experiences in "systems" work as they evolve in business, government, and industry, and (2) to stimulate the type of article Price Waterhouse & Co. is trying to support through its annual award to the *Systems & Procedures Association* member who writes the best article published in *Systems & Procedures* each year. Reprints of the complete article are available from System and Procedures' international headquarters, 4463 Penobscot Building, Detroit.

Readability in Sentence Construction

Everybody knows that there are basically three types of sentences: the simple, the compound, and the complex. Almost everybody realizes that of these the simple sentence is the most readily comprehended. On the other hand, almost nobody is willing to construct, just for the sake of readability, a paper composed primarily of simple sentences. The feeling that such an infantile style would prejudice a reader against a person's article is, of course quite justified. It is fitting, therefore, that certain suggestions for combining readability with fluency in style be offered here.

a. *In technical writing, little improvement in smoothness and considerable loss in readability and comprehensibility will result from unnecessary compounding of sentences* (two ideas yoked together by "and," where the relation between them is only incidental or accidental, such as sequence in time).

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b. *Complex sentences are, as their name implies, the most difficult sentences to grasp.* Therefore, the writer should avoid the temptation to frame his more complicated ideas in such a construction. In the two sentences above, the thought is simple enough not to suffer seriously in clarity, but the complex form of the same idea would be: "Since the complex are difficult to grasp, the writer should avoid . . ." There are also special occasions when complex sentences are desirable, such as in a series of thoughts like cause *a*, result *b*, cause *c*, result *d*, cause *e*, result *f*; here clarity is gained by using complex sentences to rotate *b* to *a*, *d* to *c*, and *f* to *e*.

c. *Greater clarity is achieved when sentences are cast in the normal English word order of subject, verb, and object.* Compare:

(1) "In this sentence, cast in an unnatural word order, meaning is difficult to grasp."

(2) "It is difficult to grasp the meaning of the previous sentence, because it it is cast in an unnatural word order."

d. *In general, the shorter the sentence the easier it is for the mind to grasp and retain its meaning.* Of course, common sense should be one's guide here as elsewhere. It is true that there may be stylistic justifications for paragraph-length sentences in the prose of some modern novels, but in the scholarly article or technical report there is little or no excuse. Style must regularly be sacrificed in technical writing on the alter of crystal-clear communication. The only excuse for putting different ideas (which might otherwise take up a sentence each) into one longer sentence is that the several ideas will be clearer because of the way they are yoked together. Compare: (1) "I am only 25 years old. However, I am wise." (2) "Although I am only 25 years old, I am wise."

e. *While a constant series of simple sentences can become monotonous, a series of complex sentences can become unintelligible.* To be graceful in technical composition, the writer should vary his sentence structure thoughtfully, casting the most difficult ideas of his paper in the simpler sentence constructions and the less difficult in the more intricate patterns.

f. *Good sentence coherence requires the writer to make evident to his reader that there exists a definite relationship between (a) the parts of the sentence itself, and (b) between the text which immediately precedes and immediately follows the sentence.* Poor coherence between elements within a sentence, for example, might result from yoking together with a coordinating conjunction two independent clauses which are not truly related.

"In 1913, an atom was supposed to consist of a positively charged nucleus about 10-12 cm in radius surrounded by electrons distributed over a volume about 10-8 cm in radius and attempts to construct a theoretical atomic model on the basis of classical physics all failed."

Not only must elements within the sentence cohere, sentences within paragraphs must show a close relationship; otherwise great confusion results. Coherence can be strengthened by the judicious repetition of key phrases (often synonyms are used to avoid unharmonious repetition) or key ideas. Coherence can also be improved by the use of what are known as transition words and phrases. Here is a brief list of such transitional aids.

Addition: *moreover, further, furthermore, again, in addition, first, secondly, finally, lastly.*

Subtraction and Contrast: *but, yet, nevertheless, still, however, to be sure, on the other hand, on the one hand . . . on the other hand, it is true, on the contrary, after all, conversely.*

Comparison: *likewise, similarly, then too.*

Coincidence: *equally important, meanwhile, in the meantime, at the same time, at the same place.*

Purpose: *for this purpose, to this end, with this object.*

Result: *hence, accordingly, consequently, thus.*

Emphasis: *indeed, in fact, in any event.*

Exemplification: *for example, for instance, thus.*

Summary: *in sum, to sum up, on the whole, in brief.*

Time: *at length, meanwhile, in the meantime, immediately.*

Place: *near by, beyond, adjacent to, opposite to.*

Readability in Paragraphing

Much of the readability of a piece of writing, if not indeed its intelligibility, depends upon intelligent and considerate paragraphing. It is through paragraphing, mainly, that the reader determines the organizational design intended by the writer for his paper. The reader has every right to expect in a lengthy article, for example, to be able to scan the topic sentences of each paragraph and come away with some understanding of the content of the paper. Here are suggestions for readable paragraphing:

a. *Construct topic sentences.* Although in some types of prose, a topic sentence need not be the first sentence of a paragraph, in the difficult prose of technical exposition, readability is definitely increased if the first sentence defines the matter to be discussed in each paragraph. From the writer's point of view, the discipline involved in establishing topic sentences will force him into a pattern of paragraphing that will not allow disunified digressions.

b. *Paragraphs must be coherent one with another.* The paragraph, like the sentence, does not exist alone or for its own sake. It must be closely related in thought to the paragraphs immediately preceding and succeeding it. This relationship, furthermore, must be made plain to the reader, often, in the following ways:

1. *By the use of forward or backward references:* By references, I mean logical references pointing forward or backward in the article to material preceding or following the paragraph in question. An example of a forward reference would be this:

   "In the following sections, various problems concerning data processing will be considered."

   Here is an example of backward reference closely followed by a forward reference:

   "It should be noted that, in each of above instances, electronic computers are employed to simulate business conditions. In the following companies, reliance is placed on conventional training course methods."

   The writer, in this example, is taking no chances on losing his reader in the labyrinth of his argument. He is also increasing the ease of comprehending the material for the reader, thus increasing its readability.

2. *By implicit relationships between paragraphs:* In an article or report dealing with a particularly complicated and hard-to-follow subject, such overt transitions and references as those above are highly desirable. But two cautions about the use of directly stated, explicit references must be advanced.

   The first is that technical or professional journals are pressed for space and prefer to have the wordage of submitted articles pruned to the last necessary word. The second caution concerns the risk of a writer's developing an overdependence upon lumbering, obvious transitions which are stylistically naive. If a man exerted himself he could probably concoct a transition from the manufacture of cheese to Hanibal's crossing of the Alps, with very little real improvement of the coherence of his paper.

Concluding the Article

Aristotle, as everyone knows, said that a work of art must have a beginning, a middle, and an end; so too must the technical article. In fact, putting aesthetic considerations aside, an adequate conclusion is perhaps even more necessary in the technical article than in a more literary form. For in purely expository technical writing, the author has no right to force his reader to shoulder the writer's burden of final analysis of data or experience presented. Articles that end in a blaze of formulas place the entire responsibility for understanding the content of the paper, even in the most general terms, squarely upon the resources of the reader. The article has not been "ended" in the sense of being completed; only a partial "Communication" from writer to reader has been attained.

The ideal conclusion to an article should have as its purpose the bringing into sharp focus of the mass of detail included in the main text. It should leave the reader feeling that the article has been completed in every feasible detail.

There are, of course, many ways of ending articles. Some are essentially summaries of material contained in the text. Some summary conclusions emphasize the unique quality of the information reported; others draw conclusions when such conclusions are possible, or candidly inform the reader that no conclusions can be made. In rare instances in published articles, specific recommendations are offered readers, a practice more common in the industrial report; general recommendations, of course, are often found in concluding sections of discussion-type articles.

Some excellent published articles helpfully suggest further areas of research yet to be studied, or point out problems raised by the paper that have need of solution. Many concluding sections of articles in areas of applied science or technology effectively suggest practical applications of the information that has been presented.

Whatever type of conclusion the author feels best for his article must satisfy not only the demands of his topic, but also the intellect of his reader, who should be reassured that all possible loose ends of pertinent information have been woven into the completed fabric of the paper. If the author faces journal restrictions on space, then perhaps he must do the best he can. But a more rigorous defense of the necessity of adequate concluding of papers on the part of both writers and editors would do much toward improving this weakest area of published papers in the technical sciences.

Conclusion

If I were to practice what I preach in this article, I might conclude this paper as follows:

Readability results from the intelligent planning and organization of material and not from applying magic readability formulas. Beginning with what I have called the "introductory element," the writer must orient the reader to the importance of the topic of discussion and supply him with the background information necessary to understand what is to be discussed.

When this is accomplished, the "main text" should be organized according to the most suitable pattern: the psychological, the logical, or the chronological—or, of course, a blend of one or more. Headings and subheadings should be added which label clearly the parts of the discussion and serve both as "breaks" in the heaviness of the paragraphing and as road signs indicating the direction of the discussion. Throughout this section, as elsewhere, the writer must control the readability of his sentence and paragraph construction and coherence.

The conclusion, finally, should in fact conclude, draw together, and often comment upon pertinent points suggested by the article. The "end" of the article should not merely be the place where the author stopped writing, but should be the inevitable end of a logical development. When all this has been done, the writer may not, of course, have produced an article worth publishing. He can, however, take solace from the fact that his work will not be rejected, despite its good ideas, because it is poorly written and painful to read. **s/p/a**

A Progress Report On EDP

Charles S. Diehl

▶ Now that electronic data processing at the Ordnance Tank-Automotive Command is entering its 5th year of routine productive operation, it is appropriate to appraise the results it has produced for the Command, the Ordnance Corps, and the Army. Basically, electronic data processing has made a major contribution toward maintaining an effective supply of tank and automotive repair parts. Prior to EDP, 60 per cent of the requests for parts were filled on time against a 55-day target. Today 80 per cent of the requests are filled on time against a 25-day target. This supply improvement is even more startling when reviewed against a reduction from $1.7 billion to around $.9 billion in inventory.

Standard Processes

The results identified above come through coordinating as well as automating standard processes. Taken in the order of their occurrence, they include:

A. *Assembling More Current and More Detailed Historical Data*

Ordnance has been able, through EDP, to put distribution management in the hands of an inventory manager instead of having a part of this function performed by the individual depots which receive, store, and issue the material. Statistics about customer demands are developed for each distribution depot and stock levels computed by department. Also, demand and issue data for the system as a whole are broken into major "customer" categories so that projections can be made for each customer and then summarized into total sales estimates. By keeping track of the number of times an item is demanded, repair parts are classified into fast, medium, and slow moving. Management attention has been focused on items which make the largest contribution to supply performance. Previous to EDP, only rudimentary statistics about issues of material were made available for the management of supply.

B. *Providing More Current and Detailed Stock Status Information*

At one time, stock status information was submitted from inventory control points once a month by depots. Information was anywhere from 90 to 120 days old before it was used by supply managers. Just before the introduction of EDP a new system was installed at depots which generated punched card stock balance data each day. It was the electronic equipment at OTAC that made it possible to process the greater volume of

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data developed from the daily punched card depot-system. A wire line communication network and transceiver equipment between depots and inventory control points made further inroads on the time required to get the information from the depot to the point where it could be used. Today, inventory data used at a control point is generally within a week of the depot records.

C. *Analyzing the Inventory Condition Coincident with the Posting of New Balances.*

Analysis involves both a depot-by-depot and system-total interrelation of on-hand, due-in, back orders, and forecast requirements. This process automatically generates shipping orders to move material from a depot in-long-supply to a depot in-short-supply, and signals the supply manager that restudy and possible new procurement is needed. Previous to the advent of EDP, redistribution was accomplished normally monthly. Procurement requirements were studied quarterly, semi-annually, or annually depending on the nature of the item.

D. *Providing a Financial Analysis of the Inventory Position.*

In this operation, five categories of on-hand and due-in assets (arranged across the top of the report) are supplied against eleven classifications of requirements (arranged on the left side of the report). When assets of the highest priority category run out, the assets of the next priority category are applied. Assets which are in excess of requirements are listed on the bottom lines of the report. Requirements which cannot be satisfied are listed as shortages on the right side of the report. This information is stratified by the machine in this way for each item and a summary is accumulated for each stock classification. An itemized report is printed for all high dollar and unbalanced low dollar items. The summary reports clearly reveal imbalances in the inventory position for each class of stock. They also show imbalances in the system as a whole for management review. The itemized reports show the specific items which contribute to the imbalances. Since the report is in dollars, it has enabled item managers to concentrate effort for corrective action on the important items. Summary data also provide the basis for budgeting and help the financial people determine in advance how much money must be allotted for new procurement. Previous to the advent of electronic data processing, no financial analysis of this type was performed.

E. *Providing Follow-Up on Overdue Supply Actions.*

Periodically, the due-in detail file and the availability balance file (these data are on magnetic tapes) are analyzed by EDP to determine such situations as:

(1) Reorder point warning given; no material due-in.

(2) Material on requisition; contract not placed on time.

(3) Material on contract; shipment overdue.

(4) Material in transit; receipt overdue.

(5) Stock balances reported by depots; total disposal authorized.

Periodic review of the entire file finds those items where action required is past due. This "closed loop" follow-up system has proven an invaluable tool to management in correcting situations where slippage has occurred and has uncovered areas where improved reporting and handling of data were necessary. For example, prior to EDP, there was no "exception" type follow-up system.

F. *Printing Manuscript for Repair Parts Catalogs.*

Lists of repair parts for each vehicle are recorded on magnetic tape. As new items or changes are fed to this file, punched cards are developed and sent to selected field installations. Proof cards are sent to a maintenance technician to verify that the items have been included in the official files. When a catalog of parts is due for printing or revision, a proof manuscript is produced, the items are keyed to illustrations, and the information is fed back to the electronic data processing system. A final manuscript, in illustration sequence, is then producted. Before

EDP the catalog data were maintained in metal plate files. Field installations were notified on separate written pieces of paper from which cards were punched. There were no illustrated catalogs.

G. *Computing the Vehicle Population Trend for Each Repair Part.*

Information about the quantity of vehicles in use during the past year and forecasts for the next three years are matched against the catalog list of repair parts for the vehicles. The information is sorted according to repair part stock number and summarized for each part. Ratios of present to future populations of vehicles using each repair part are computed. These data are used to forecast future "sales." in addition to providing ratio data, it is necessary to know the absolute number of vehicles. The electronic system compiles this information too. Since it is classified information, the equipment has been taught cryptology and the information is printed out in coded form. This has made it possible to eliminate 30,000 "secret" documents and a large administrative headache.

These computations were previously made by people who manually "interrogated" files, looked up the information in secret books, and manually computed the information on desk calculators.

H. *Determining Spart-Part Requirements for New Troop Units.*

The number of initial spart parts needed to support a new vehicle moving into a field installation is computed from the same magnetic tape file used to develop catalog manuscript and compute trend factors. Before converting cataloging to the EDP system, this information was developed from a manually maintained punched card file which never agreed with the stock records. The monogamous file now used for this purpose is reducing the need for people to screen these listings to determine the latest approved repair part.

I. *Processing Customer Requisitions.*

For the past nine months, EDP has processed an average of 2,000 army requisitions and 1,200 MAP requisitions each day. Army customers order from ordnance depots in their geographic area. Requisitions which cannot be filled from local depot stocks are "extracted" via wire lines to the inventory control point. Military Assistance Countries (Map) place their orders directly to the inventory control point. EDP automatically refers about 75 per cent of these requisitions directly to a secondary source for filling. The remainder is "printed out" for manual review. This includes high dollar controlled items and items approaching a low stock position.

Decisions made about items on the list automatically printed for review are fed back to the EDP system and are merged with the machine-made decisions for "document composition." Decisions made manually are fed back to the EDP system and are merged with the machine-made decisions for "document composition." This operation takes care of preparing the status information for the depots, advising the customer of actions taken, creating an internal record for answering customer follow-ups, and providing necessary operating statistical summaries for management. This has been made possible by a unique coding system.

All the information needed to determine the exact destination of material and to edit the customer demand is coded into a punched card. Before, punched card shortage reports were sent to the inventory control point by the depots, processed manually, and "advice" was returned to the depots indicating where the material was available. The actual paper requisition form was then mailed from the initial source, indicated by the inventory manager. Today, information for over 90 per cent of the requests for supplies are in the hands of secondary sources within two days after the initial request was forwarded to the inventory control point.

Special Projects

In addition to the basic repetitive processes just described, a whole group of special projects contributing to better supply handling has been completed with the help of EDP. Some of these special projects have involved modification of standard programs. Others required the development of special programs. Some of the more important special projects are:

A. *Reduction of Unprocessed Backlog of Military Assistance Country Requisitions.*

At one time, the system piled up over $200 million in back orders for mutual assistance countries. Review of the orders showed that duplicates were being submitted at regular intervals because of inability to obtain required supplies. A machine analysis of all back orders was made, country by country, item by item, and showed that such duplication was general rather than for a few items. The lists prepared by EDP were given to army officers who took them to the MAP countries and verified that the material had been ordered in duplicate. The result was the cancellation of approximately $130 million worth of material — a direct savings to taxpayers.

B. *Special Stock Leveling.*

In response to an international situation, the overseas theatre involved determined those items of supply hostilities. These requirements were fed to OTAC's EDP which determined whether they were available at the depot assigned to support this theatre. As a result the material which was not available was on its way to this depot within a few days.

C. *Supply to a MAP Support Depot.*

A special depot established in one MAP area was to be stocked with items which were in long supply in the U. S. Requisitions received from the area were first priced by EDP to determine their reasonableness thus revealing any excesses or duplications. Information about the corrected requisitions was then fed to EDP and the items in long supply were issued. This activity involved an exercise dealing with millions of dollars worth of material and several millions involved in excess orders were saved.

D. *Purging Obsolete Items from the System.*

From 1956 to the present time, the number of items in the Tank-Automotive supply system has been reduced from over 175,000 to approximately 100,000. A special program was used to pick out items which were dormant and could be eliminated. Millions of cards have been withdrawn from active cataloging files in connection with this operation.

E. *Cost Estimates for Initial Loads of Repair Parts Required to Support MAP Vehicles.*

Before EDP, the information about initial loads of repair parts required to support MAP vehicles was developed through "educated guesses." These guesses were not always accurate and gave rise to much customer dissatisfaction.

F. *Procurement Forecasts for Engineering Records.*

Engineering drawings are essential for the procurement of certain items. By using the machine to forecast complex assemblies which are needed, engineering personnel can concentrate its efforts on these items. This operation is derived as a by-product of the financial inventory analysis and contributes to reduced procurement lead time.

G. *Department of Defense Cataloging Program.*

One of the essential elements of the defense department's cataloging program is a review of items to see if one supply item is carried under two different stock numbers (Accelerated Item Reduction). The job of bringing the necessary information together and of properly documenting the results for the federal stock classes assigned to the Ordnance Command by the department of defense, has been accomplished by EDP. It involved passing through the system, data from millions of punched cards, collating, item numbering, re-collating, etc., until all potential conflicts were brought together.

H. *Army Supply Manual for Ordnance Items.*

The identification of material at army posts, camps, and stations is facilitated by published lists. These lists show the part, stock, and drawing numbers. The data from which this information is developed are on magnetic tape. Manuscript for these cross-reference listings is developed automatically by EDP.

I. *Match of Vehicle, Catalog Records, and Supply Records.*

Before using magnetic tape, vehicle catalog records were in files separate from the supply records. As is always the case under such circumstances, the two sets of records were not in complete agreement. After the records were put on magnetic tape, it was possible to compare the cataloging records automatically with the stock records and to isolate all discrepancies. With these isolated, it was possible to review them manually and make the necessary corrections.

Lessons Learned

In the process of acquiring all this experience, some lessons stand out. They include the following:

A. *A problem must be thought through from start to finish before beginning to program and write procedures.*

The creation of a new file and a new organization of information is often necessary to solve a problem or perform some new function with electronic data processing equipment. The file may be related to some other file but when people maintain it, the relationship is frequently somewhat loose. At the Ordnance Tank-Automotive Command, electronic equipment has succeeded in "capturing" vital data such as:

1. Availability of and requirements for each item.
2. Supporting due-in records for each item.
3. Demand and issue history of each item.
4. Catalogs of repair parts required to service each vehicle.

With this information on magnetic tape, practically no special project or new function is accomplished without reference to it. Sometimes the solution of a problem involves changing codes or data in one or more of the files maintained by EDP. If the subsidiary effects of changes are not completely thought through for all processes which use these files, improper results are produced in other areas. This situation forces a discipline of consistent planning which, while painful at the time, ultimately produces better results. That is, the solution to a particular problem must be considered in relation to its effects on the total system rather than being planned as an isolated operation.

B. *Data maintained in an electronic data system must be more accurate than if kept in a conventional system.*

A procurement or redistribution decision by EDP results from a review of about 500 pieces of information in the availability balance file on magnetic tape. Many of the pieces of information in this file are in turn supported by data in other files. For example, the demand summary file and vehicle parts file support data about requirements. The due-in detail file supports the summary due-in figures. A single machine decision is often the result of over a thousand pieces of information kept in an electronic system. Based on human experience, one might think that 99.9 per cent accurate data is good. However, if each of 1,000 pieces of data has 1/10 of 1 per cent error, the error in the resultant decision can be as great as 100 per cent, clearly an intolerable condition. In manually operated decision making systems, data are usually brought together only periodically—frequently long after the fact. Some of the data may be machine tabulated, some manually generated. In the process of bringing such data together, either manual intervention or the passage of time corrects many discrepancies. On the other hand, when data is maintained for electronic equipment "report by exception," a very small error rate in data will cause a large proportion of exception reports.

C. *Integrated data processing forces data discipline on the people who feed it and use its results.*

In an integrated system which uses the same information for a multitude of products, one piece of bad data frequently shows up as a multitude of bad results or output—often in areas which are not the primary responsibility of the organization or persons causing the bad data. Naturally the affected organization complains. Bad data, therefore, which would rarely be detected in a non-integrated system must, in an electronic system, be isolated and corrected.

D. *Data discipline can be improved by the "closed loop" follow-up system.*

The closed loop follow-up is characterized by the following sequence of events:

1. Record data in the information processing system about action that has been directed—either manually or by machine.
2. Establish a time limit for taking the action.
3. Clear system records by posting transactions reflecting action taken.
4. Review the entire file periodically to determine overdue actions.

Lists of overdue actions are not generally received enthusiastically by the organization that must work them but they do reveal a system's failure to process information. A careful analysis of the results of such follow-up can help to detect causes of error and "plug up loop holes."

E. *Management must take a direct personal interest in the use of the products of an automatic data processing system.*

Systems are operated by people. Introduction of electronic data processing means new systems. These new systems show up the mistakes of people. System designers and programmers overlook or misinterpret process requirements. Operating personnel do not get the right data to the right place at the right time. Such errors show up false exception reports and bad decisions. Operating people then say the machine is wrong, ignore the results it produces, and revert to more traditional practices which subvert the results expected from the machine. The most effective catalyst that management can provide is to insist that operating organizations account to them for the data appearing on exception reports and follow-up lists.

F. *Know your data.*

In both the design and the day-to-day operation of a system, detailed and precise knowledge of the data coming to and being processed by the system is indispensable. Input data, including control overpunches must be known and its use thoroughly understood if reprocessing together with the attendant delays is to be avoided. Failure to appreciate all aspects of input data, particularly where it is submitted by an outside organization, can result in time consuming reprograming of data when its meaning is revealed. Knowledge by operating personnel of logical interrelations of data can lead to the early correction of errors that might otherwise permeate the system and be difficult to correct "after the fact."

G. *The more data and more processes you automate to electronic equipment, the more effort must go into program maintenance.*

It was believed that a computer program once written could be used in that manner indefinitely. This is not true. Someone is always finding a way to make a system work better, produce a result which it could not produce before, or answer a question which could not be answered before. These ideas frequently require computer program changes

H. *The rate of change in programs is related to the age of the program.*

Newer processes frequently undergo rapid and in some cases almost explosive change. Older processes tend to be more settled. Since people cannot foresee every eventuality, changes must be made as the bugs are worked out of the programs.

I. *The rate of change is related to the organizational scope of the program.*

In data flow systems, information crosses organization lines. Procedures and regulations (often unwritten) govern this flow. The longer the command chain back to a common boss, the greater the number of staff agencies writing regulations and procedures governing the information flow. Each layer imposes detail. Each source initiates changes of its own for a computer program. Programs which process data that flow across major organization lines are subject to more change than those producing data used only by the group "next door."

Future Plans

No organization is ever static and the Ordnance Tank-Automotive Command is no exception. Plans for the future involve

changes in data processing and are part of a constant effort to improve. Two separate yet interrelated aspects of future plans are mechanization of functions not yet on automatic data processing and the planning necessarily associated with acquisition of new equipment.

In the inventory control area, there are still significant tasks to be accomplished by the data processing equipment. At present these include the following studies:

1. Automating supply control either on demand or upon reaching the reorder point. This study includes a machine calculation of how much to buy and the preparation of associated procurement documents.
2. Mechanizing the maintenance of the due-in detail file (this is now maintained manually from punched cards). The data are then analyzed by the computer.
3. Capturing and integrating the Federal catalog and ordnance master file which includes basic descriptions of the parts, interchangeable items, reference numbers, and all end-item usage (logistical) information.
4. Mechanizing the maintenance of status files for MAP requisitions, reconciliation of proof of shipment data, and preparation of bills and reports.
5. Maintaining records of all items on back order in the supply system (currently most of this is done at deports).

Outside of inventory control, studies are currently under way to ascertain the feasibility of mechanizing command administrative functions and national missions associated with research, engineering, and industrial phases of the business.

Past experience suggests that some new basic assignment will be made to the inventory control point before all these tasks are completed.

All of this activity, of course, must be supported by adequate equipment. Plans are currently under way to augment the existing system with modern equipment. Long-range plans envision replacement of the equipment now being used with faster and more compact transistorized equipment. **s/p/a**

Richard W. Reynolds

Do They Understand You? *(A Guide to Effective Oral Communication) by Wesley Wiksell; The MacMillan Company, New York, 200 pp., 1960, $4.95*

In the preface the author states "this book may be used as a text for short courses in face-to-face business and industrial communication." Although comprehensive, Professor Wiksell's coverage of oral communication problems and recommended solutions is slanted primarily for management and supervisory personnel, concentrating on manager/supervisor relationship to subordinates. Coverage of lateral communication problems is lighter, and upwards communication is not covered at all, but, within this limitation *Do They Understand You?* is a highly readable book, well illustrated by Sam Heidelberg. It is divided into four sections:

1. General communication problems and responsibilities including some startling statistics on the low efficiency of communication in business, industry, and the schools.

2. The physical, environmental, attitudinal aspects of speaking, as well as habit patterns, trade jargon, and the use of words to gain understanding (or to deceive). After digesting this section, the reader may feel that Professor Wiksell retreats too far from the practical into the theoretical approach, especially in his treatment of the use of words. One cannot but feel that, to comply with the recommendations and conclusions in this section, one must be in business to communicate rather than vice versa. For example, in a list of words designated as too long or too complex, we are discouraged from using such words as "accumulate" for "gather," "anticipate" for "foresee," "complete" for "finish," "expedite" for "hurry," etc. He may be correct, but it would be quite a task to retrain American businessmen to

talk about "staff foreseeing," "parts hurriers," or "gathered costs."

3. Here, listening is covered with the same thoroughness as speaking was in the previous section. Advice about listening is highly practical, and, in this reviewer's opinion would alone make the book worthwhile reading.

4. "Pattern for Communicating," contains much worthwhile advice on face-to-face conversing, individual and group conferences, conference leadership, giving talks, and telephone conversing.

Each section ends with tips for self-improvement in the area covered and with a questionnaire designed to test your skills (and highlight your weaknesses) in that area.

Do They Understand You? is worth reading. It contains practical advice about acquiring better speaking and listening skills, and covers problems we frequently overlook in our everyday communication. (Reviewed by Thomas G. Horti, Lockheed Aircraft Service—New York, Inc.; member, Long Island Chapter, SPA).

Computers and People *by John A. Postley; McGraw Hill Book Co., Inc., New York, 246 pp., 1960, $6.*

Someone once likened the attitude of many of our business managers about EDP today to that of the little Mexican boy whose relative was "only a little bit pregnant." *Computers and People* has been written for those who, to date, have had neither opportunity nor incentive to keep up-to-date about technical phases of EDP, but who realize that there is no such thing as being "only a little bit" pregnant.

Written in clear language, this book offers practical insight into effects that EDP is having on the non-technical manager. More concerned with *why* than *how*, the author (a pioneer in the computer field) realistically discusses new techniques of business operation and control which have become possible through the newer equipment. Discussion is clear about the elements and degree of flexibility necessary on the part of both the data processing specialist and the organization. Without an understanding of the need for such two-way flexibility, it is improbable that optimum effectiveness of EDP can be achieved in a company. This is the significant message of this book.

Also discussed in *Computers and People* are common misconceptions of EDP, information about future equipment and capabilities, and of the social problems created by EDP. In short, this is a book that helps to take the mystery out of EDP and, as such, is recommended reading for all non-technicians. (Reviewed by Richard W. Reynolds, F. W. Lafrentz & Company; Lincoln Center Chapter, SPA).

A Guide to Office Clerical Time Standards, *edited by Colver Gordon; Systems and Procedures Association, Detroit, 169 pp., 1960, $15.*

The fastest and often the most effective way to check the creeping paralysis of increasing costs has been work measurement. Why then has it been used so little? Many, often experts in systems, will jump into an electronics feasibility study and installation, which may take years and cost millions, but look upon clerical work standards as something untouchable; something to be mentioned but not understood. Yet, in all reality, work measurement is the most scientific tool that management has at its disposal.

Many excuses are offered for this rather strange situation. Lack of readily available information about standards is perhaps one of the principal ones. This void — lack of information about standards—has been filled by another contribution from the Systems and Procedures Association. *A Guide to Office Clerical Time Standards* is offered as a practical rule-of-thumb guide to today's businessman. With one exception, in which actual performance data were used, the book is primarily a compilation of clerical standards from representative individual companies in American industry. Standards from some previously published sources are also included.

The first chapter of the book presents a program for clerical cost control developed by a leading American company. This is a concise and easily understood statement of work measurement; one of the best in print

today. Instructions for making such a survey show the advantage of being well trained in systems fundamentals. While not mentioned in so many words, it is clear that an effective clerical time standards program can be properly administered only through up-to-date standard procedures. Much of the work required to establish a standards program is pick-and-shovel activity. The sophistication reached by an established program and the improved supervisory and managerial control that result therefrom come about after much planning and diligent work.

A word of caution: the standards presented in this book are not to be used like a statistical table from which one determines the number of acres in a hectare. The editor enumerates in the Forward a few of the factors which affect a routine procedure and the standards involved.

The lack of a bibliography and the poor arrangement of the index are this publication's only shortcomings. These are not serious. Anyone keenly interested in scientific administrative management should own a copy of *A Guide to Office Clerical Time Standards*. It is recommended as a must for every systems man who is interested in the total systems concept. (Reviewed by F. Gerard Mueller, Commercial Credit Corporation; member, Baltimore Chapter SPA).

How To Build Job Enthusiasm *by Edward J. Hegarty; McGraw-Hill Book Company, Inc., New York, 257 pp., 1960, $5.95.*

That the most profound truths all too frequently escape us because of their utter simplicity is a platitude which is re-affirmed by this author and the wealth of material he brings to his task. Now a business consultant and for three years head of a clinic in human relations in management, Hegarty draws on countless anecdotes illustrating that people are individual but all have the same basic wants and needs—and these are the keys to supervisory success.

This book, written in a "chatty" style (you can read it in one or two sittings), strikes one as a personal conversation with the author wherein, for example, he shows the reader what to do in a specific situation and makes him a partner in this training by rhetorically asking, "Now you've given the worker an incentive to do better, haven't you?" and so on.

Taking about one-fourth of the book to review various aspects of the problem and the terms in which it will be solved, Hegarty then proceeds to explain and apply the many tools that can help any leader build staff enthusiasm. Hegarty discusses how job descriptions, tests and ratings might be used, as well as motivation, training, and control. Elsewhere the author ranges from selling the worker on both tangible and intangible benefits, and how to get tough when necessary, to how to work *like* a human being *with* human beings.

This work is recommended to anyone in a supervisory capacity (including SPA Chapter and Committee officials) and highly recommended to anyone who feels a need for this kind of help. (Reviewed by Frank Mayer, Norair Division, Northup Corporation; President, Inglewood Chapter, SPA.)

Management by System, *2nd edition by Richard F. Neuschel; McGraw-Hill Book Company, Inc., New York, 347 pp., 1960, $7.95.*

This is the second edition of a book which has already made its place in management courses of universities and colleges. The contents are top-management oriented. How to run a systems organization is the basic theme. Administrative techniques are described for research programs, planning systems, selling systems to management, installing systems, and controlling them after they are installed.

The book is not electronics oriented, although there is a chapter on electronics and another on IDP. Emphasis is put on an orderly approach to all systems problems to avoid the necessity for constant fire fighting by the systems department. Methods analysis and planning is put on the plane of research and investigation which will reveal forthcoming problem areas before they cause real operating difficulties. Examples of tested techniques are used throughout. Some case examples show correct and incorrect approaches to a problem and their ultimate results.

Mr. Neuschel has his material well organized and presents it in a clear and readable style. *Management By System* is not a theoretical bookish treatment; it is the statement of experience by one obviously well informed. Basic questions which confront all systems men are examined for the *pros* and *cons* of various solutions. The book moves ahead from page 1 to the end without confusion. Every systems man should have it on his shelf for reference. In many cases it can serve as a refresher on problems that have been previously thought through, with reasons since forgotten. It is particularly helpful for material about selling plans to management because the book is top-management oriented. Quotations from it can be used to back programs suggested to management. (Reviewed by Gordon Nonnemacher, I.T.T. Laboratories; Lincoln Center Chapter, SPA).

Mathematical Programming *by Nyles V. Reinfeld and William R. Vogel; Prentice-Hall, Inc., Englewood Cliffs, N. J., 247 pp., 1958, $8.*

The major objective of this book, according to the authors, is to bridge the gap between the techniques of mathematical programming and their application to practical business problems.

Fundamental techniques are explained so that readers lacking an extensive mathematical background can absorb them. Examples are given of their application to common business problems.

The whole emphasis is on a practical approach to mathematical programming sacrificing some of the preciseness of the theoretical approach. The problem of obtaining management acceptance of *mp* is discussed thoroughly.

The book, however, makes little mention of the methods used to obtain data necessary to formulate an *mp* problem. *Mp* requires precise data and a systematic approach to the solution of a problem. According to the authors, a system using these techniques can be taught to clerks with no mathematical background. It thus appears that *mp* offers an added tool in achieving optimum results from a systems effort.

The book is not a complete text-book for the mastery of mathematical programming. It does remove the mystery and shows the advantage of *mp* in solving some business problems.

The author's opinion is that the best use of *mp* techniques can be made by business-oriented people rather than those specializing in operations research. This presents a challenge to the systems man and operating manager alike to become more familiar with *mp* and to add it to their repertoire of management techniques. (Reviewed by Richard F. Dobbins, F. W. Lafrentz & Co., New York). **s/p/a**

Worth Reading

S. Joseph Schneider

"When the Computer Takes Over the Office," Ida Russakoff Hoos, *Harvard Business Review,* July-August, 1960.

Examines the effects of EDP installations on personnel, organization, and management. The article is based on a two-year study of 19 organizations in the San Francisco area. The major conclusions are:

Personnel: For each 5 jobs eliminated, only 1 is created. When middle-aged workers and supervisors are displaced, they find it difficult to obtain positions of equal status.

Organization: The trend to decentralization is being replaced with recentralization of large-scale record keeping.

Management: Fewer middle management positions are necessary due to fewer clerical employees. Greater demands are placed on management to define their goals and requirements precisely in order to obtain full benefits from EDP.

"Fast Processing of Daily Orders," George Howard, *The Controller,* July, 1960.

Very detailed illustrated statement of Breyer Ice Cream's system and billing repeat daily orders. Transceivers, mark-sensed cards, and an IBM, 650 are used.

"Clerical Work Measurement Keyed to Modern Equipment," L. O. Sweval, *The Controller,* July, 1960.

Brief description of MTM standards for office work available from a consultant. A sample filing process shows how a standard time of .414 minutes is set for filing an invoice.

"Automation Serves Customer at W. T. Grant," *Office Management and American Business,* June, 1960.

An explanation of W. T. Grant's use of "point-of-sale" punched paper tape for centralized accounting. When sales are rung on a cash register, a by-product tape is punched with data about department, price, and type of item. Tapes are mailed daily to the home office where a Monroe computer prepares totals by store and departments within a store. Weekly, item totals within departments are figured and, by comparing with the previous week's data, required accounting entries are developed.

"Administrative Systems — A Management Necessity," Dean A. McGee, *Management and Business Automation,* July, 1960.

Presents a company president's view of the role of systems and procedures people in a large company. Their value to all levels of management is determined by how well systems people create better communications and control within the organization. The study of control areas and the establishment of procedures to implement control require the special skills and aptitudes of systems and procedures people, just as legal or accounting problems require a lawyer or accountant.

"A Records Program through the Back Door," Leslie Matthies, *Office Executive,* May, 1960.

A summary of the problems met in installing a records program and the techniques used to solve them. For example; (1) cooperation from operating people was forced by a memo from management stating that no added filing equipment would be issued unless a file survey of the department had been made in the past 6 months, (2) since operating people had difficulty stating retention requirements, a statement was issued that they would not be held responsible for legal and financial aspects of retention and they should simply state the length of time a record was needed for their work.

"How to Get Ideas From Idea Men," Raymond Dreyfack, *Management Methods,* June, 1960.

Characterizes an "idea man" as one who is sensitive, unconventional, and quick thinking; respects competence, needs freedom, and craves recognition. To encourage performance, creative ideas must really be welcomed by managers, and monetary and prestige rewards must be adequate.

Publishers:

1. *The Controller,* Journal of the Controllers Institute of America, 1 East 42nd Street, New York 17, New York.
2. *Harvard Business Review,* Published bi-monthly by the Graduate School of Business Administration, Harvard University, Soldiers Field, Boston 63, Massachusetts.
3. *Management and Business Automation,* The Office Appliance Co., 600 W. Jackson Boulevard, Chicago 6, Ill.
4. *Management Methods,* Management Magazines, Inc., 141 E. 44th St., New York 17, N. Y.
5. *Office Executive,* National Office Management Association, Willow Grove, Pa.
6. *Office Management and American Business,* Geyer-McAllister Publications, 212 Fifth Ave., New York 10, N. Y. s/p/a

THE POWER OF MEDIOCRITY

▶ Progress in every age has been slowed immeasurably by the heavy bondage in which the ignorant and unthinking are held by the dead weight of custom and belief.

Those who know only simple truths (or what they believe to be truths) and who have not the wit to interpret ideas, to apply learning to custom, or to explore new ventures in human thought, are inclined to become distrustful of the man whose mind makes him so bold as to point out errors in widely held beliefs, and who attempts to move people toward more sensible ways of doing things. To learn new ways calls for a kind of mental exercise to which rut-dwellers are unaccustomed and for which they are ill-equipped.

The intelligent man, therefore, frequently must "kowtow" to mediocre men because he cannot buck the disapprobation of the mass. The man of vision must pay covert lip service to the shibboleths of the ignorant to avoid creating widespread distrust, which in time may render him impotent.

This state of affairs illustrates the power of mediocrity to hobble progress. Analagous situations occur at all levels of human endeavor.

Before a systems man makes the most innocuous of changes in the simplest of procedures, he must study both the direct results as well as possible side effects of the change. Otherwise, he may be courting failure. By the same token, when he wants to introduce a novel technique or change an important policy, he must not only work out his new plan carefully but also must make an exhaustive study of the people with whose prejudices and habits he proposes to tamper. If he does not, he will not get to first base. But if he does a careful job and talks sense to those willing to listen (and skillfully brain-washes those incapable of understanding the reasons for the proposed changes), there is a chance that he may round the bases and slide safely home.

A good thinker can become a positive force in society only if he avoids the many roads to failure which lie open to him. If he acts like a maverick, rebel, man-ahead-of-his-time, or some other ape cognomen for this type, he will probably be classified as a crackpot and will accomplish little beyond serving as a passing source of amusement — or annoyance.

At the other extreme of the pendulum's swing lies the danger of becoming a progressive "conformist" — one who apes the ignorant so well that he constantly faces the danger of joining them. But, between this Scylla and this Charybdis, lies a wide enough channel for the man-of-good-reason to navigate a safe course. He can retain his originality of thought and independence of judgment, provided he tempers them with an honest respect for the wisdom of ages past and with a warm appreciation of the peculiarities of human thought and motivation. If he can achieve this rare balance within himself, he will have a better than average chance of making a worthwhile contribution to human progress and to his own personal happiness. (Gibbs Myers, member, Northern New Jersey Chapter, 1960 SPA Systems Man-of-the-year) **s/p/a**

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*A 10-Year Accumulative Index of *System & Procedures* (1948-58) is available from the S. & P. International Headquarters, 4463 Penobscot Building, Detroit.

**1960 Price Waterhouse & Co. award winner

Books Reviewed:

FEBRUARY —

Corporate Records Rentention, Volume 2, edited by Robert B. Wheelan; Controllership Foundation, Inc., Two Park Avenue, New York 16, 275 pp., 1959, $10.

Handbook of Automation, Computation, and Control, Volume 2, edited by Eugene Grabbe, Simon Ramo, and Dean E. Wooldridge; John Wiley and Sons, Inc., New York, 1959, $17.50.

Preparing the Office Manual, by M. Graham Kellogg; American Management Association, 72 pp., 1959, $2.25.

Production Control (Second Edition), by Franklin G. Moore; McGraw Hill Book Company, 655 pp., 1959, $8.50.

Systems and Procedures Responsibility, by Philip H. Thurston; Harvard University, Soldiers Field, Boston, 110 pp., 1959, $2.50.

MAY —

Administration: Its Purpose and Performance by Ordway Tead; Harper & Bros., New York, 79 pp., 1959, $2.50

Automation and Society edited by Howard Boone Jacobson and Joseph S. Roucek; Philosophical Library, New York, 553 pp., 1959, $10.

Dynamic Management Decision Games by Jay R. Greene and Roger L. Sisson; John Wiley and Sons, Inc., New York, 1959, $2.50.

Managing by Communications, by Willard V. Merrihue; McGraw-Hill Book Co., New York, 306 pages, 1960, $7.

Operations Research—Methods and Procedures, by Maurice Sasieni, Arthur Yaspan, and Lawrence Friedman; John Wiley & Sons, Inc., 316 pp., 1959, $9.50.

Punched Cards, Their Application to Science and Industry (Second Edition) edited by R. S. Casey, J. W. Perry, A. Kent, and Madeline Berry; Reinhold Publishing Corp., New York, 697 pages, 1958, $15.

Records Retention—A Practical Guide, by William E. Mitchell; Ellsworth Publishing Company, 314 Newcastle Road, Syracuse 4, New York, 48 pp., 1959, $5.00.

SEPTEMBER —

Automatic Data Processing Systems by R. H. Gregory and R. L. Van Horn; Wadsworth Publishing Co., Inc., San Francisco, California, 705 pp., 1960, $8.75.

Management in the Industrial World: an International Analysis by Frederick Harbison and Charles A. Myers; McGraw-Hall Book Co., New York, 413 pp., 1959, $7.

Measurement and Evaluation of Organizational Performance by Paul Wasserman; Graduate School of Business and Public Administration, Cornell University, Ithaca, N. Y., 110 pp., 1959, $3.75.

Motion and Time Study by Marvin E. Mundel; Prentice Hall, Inc., Englewood Cliffs, N. J., 690 pp., 1960, $11.95.

Programming Business Computers by Daniel D. McCracken, Harold Weiss, and Tsai-Hwa Lee; John Wiley & Sons, New York, 510 pp., 1959, $10.25.

The Punched Card Data Processing Annual; Gille Associates, Inc., Detroit, Michigan, 239 pp., 1959, $15.

Work Improvement by Guy C. Close, Jr.; John Wiley & Sons, Inc., New York, 388 pp., 1960, $7.75.

NOVEMBER —

Computers and People by John A. Postley; McGraw-Hill Book Co., Inc., New York, 246 pp., 1960, $6.

Do They Understand You? (A Guide to Effective Oral Communication) by Wesley Wiksell; The MacMillan Company, New York, 200 pp., 1960, $4.95.

A Guide to Office Clerical Time Standards, edited by Colver Gordon; Systems and Procedures Association, Detroit, 169 pp., 1960, $15.

How to Build Job Enthusiasm by Edward J. Hegarty; McGraw-Hill Book Company, Inc., New York, 257 pp., 1960, $5.95.

Management by System, 2nd ed. by Richard F. Neuschel; McGraw-Hill Book Company, Inc., New York, 347 pp., 1960, $7.95.

Mathematical Programming by Nyles V. Reinfeld and William R. Vogel; Prentice-Hall, Inc., Englewood Cliffs, N.J.: 274 pp., 1958, $8.

SYSTEMS & PROCEDURES ASSOCIATION PUBLICATIONS

COMPUTER USE REPORT (2nd printing 1959)

This publication gives specific figures on the use of Electronic Data Processing equipment in three major categories. It clearly identifies the acceptance of EDP equipment in 14 named applications. Reasons, opinions, savings and computers used are statistically reported on applications accepted. Over a dozen reasons are listed on EDP equipment rejected on 14 applications as well as five stages at which rejection occurred. Figures from 20 different industries showing acceptance or rejection of EDP for use in the 14 applications are also included.

8 pages — List Price.....$1.50
Member Price.....$ .75

THE PROFILE OF A SYSTEMS MAN (1st printing 1960)

The material presented in this study shows the 'Profile' of the systems man—his age—education—experience—for whom he works—where he works—his duties and his salary. Figures are included pertaining to size of systems units, activities of the systems unit, and to whom the systems department reports. Operations research activity in and out of the systems group is reported statistically. Further detailed figures on salary includes: per cent of time spent on systems work—years of systems experience—educational level—age—type of company.

16 pages — List Price.....$5.00
Member Price.....$2.50

THE SYSTEMS MAN AND E.D.P. (1st printing 1960)

The booklet reports on the impact of the computer in the firms represented by SPA membership, and the effect of a computer installation on the individual systems and systems department. Figures record statistically per cent of total period the systems man was associated with feasibility study, and per cent of time spent after EDP system was in operation. Equipment manufacturers contacted and number of contacts made is tabulated by 15 EDP manufacturers.

8 pages — List Price.....$2.50
Member Price.....$1.25

A GUIDE TO OFFICE CLERICAL TIME STANDARDS (1st printing 1960)

Publication of the results of this research activity is intended to fill a much wanted need of today's business man . . . that is, a practical "rule of thumb" guide he can use to determine approximately how long it takes to perform conventional operations in clerical systems which he is required to supervise, design and evaluate.

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